CLAIMS

1. A field grading material comprising a field grading effective amount of a nanoparticle filler distributed in a polymeric matrix, wherein the nanoparticle filler is heterogeneously distributed in the polymeric matrix.

2. A field grading material according to claim 1, wherein the nanoparticle filler is selected from semiconducting materials having an energy bandgap ranging from 0 eV to 5 eV and dielectric materials having a bulk dielectric constant at infinitely high frequencies of at least 5.

3. A field grading material according to claim 1, wherein the nanoparticle filler comprises a semiconducting material.

4. A field grading material according to claim 1, wherein the nanoparticle filler is selected from ZnO, SnO, InO, CeO, TiO_2, SiC, $BaTiO_3$, Al_2O_3, SiO_2 and mixtures thereof.

5. A field grading material according to any of the above claims, wherein the polymeric matrix comprises a rubber, a thermoplastic polymer, a thermosetting polymer or thermoplastic elastomer.

6. A field grading material according to claim 5, wherein the polymeric matrix comprises a polyolefin rubber, a thermoplastic polyolefin elastomer/plastomer, a silicone rubber or a crystalline thermoplastic polymer, preferably a crystalline thermoplastic polymer, and more preferably polyethylene.

7. A field grading material according to claim 5, wherein the polymeric matrix comprises a polymer selected from EPDM and polyethylene.

8. A field grading material according to any of the above claims, wherein the polymeric matrix comprises a polymer blend of immiscible polymers.

9. A field grading material according to claim 8, wherein the polymer blend is selected from polyethylene/EPDM, LDPE/HDPE, and maleic anhydride-modified EPDM/EPDM.

10. A field grading material according to any of the above claims, wherein the nanoparticles have a particle size ranging from 2 to 80 nm, preferably from 5 to 50 nm, and most preferably from 5 to 30 nm.

11. A field grading material according to any of the above claims, wherein the nanoparticle filler comprises less than 40% by volume of the field grading material, preferably less than

30% by volume of the field grading material, and most preferably less than 20% by volume of the field grading material.

12. A field grading material according to any of the above claims, wherein the surface of the nanoparticle filler is modified by treatment with a organosilane or organotitanate compound and the organosilane compound comprises an organic group selected from alkyl, alkylamino, amino and carboxy.

13. A field grading material according to claim 12, wherein the organic group is selected from methyl, decyl, octyl, vinyl, aminopropyl and acetoxy.

14. A field grading material comprising a nanoparticle filler distributed in a polymeric matrix, wherein the surface of the nanoparticle filler is modified by treatment with a organosilane or organotitanate compound and the organosilane compound comprises an organic group selected from alkyl, alkylamino, amino and carboxy.

15. A field grading material according to claim 14, wherein the organic group is selected from methyl, decyl, octyl, vinyl, aminopropyl and acetoxy.

16. A field grading material comprising a carbon nanotube filler distributed in a polymeric matrix, wherein the filler is heterogeneously distributed in the polymeric matrix and the polymeric matrix comprises a rubber, a thermoplastic polymer, a thermosetting polymer or thermoplastic elastomer, preferably a polyolefin rubber, a thermoplastic polyolefin elastomer/plastomer, a silicone rubber or a crystalline thermoplastic polymer, more preferably a crystalline thermoplastic polymer, and most preferably polyethylene.

17. A field grading material according to claim 16, wherein the polymeric matrix comprises a polymer selected from EPDM and polyethylene.

18. A method for reducing electric field stress at a joint or termination of an electric cable, said method comprising introducing in the joint or termination a field grading material according to any of the above claims as a field grading material.

19. A insulating material comprising a insulating effective amount of a nanoparticle filler distributed in a polymeric matrix, wherein the nanoparticle filler is heterogeneously distributed in the polymeric matrix.

20. A insulating material according to claim 19, wherein the nanoparticle filler is selected from semiconducting materials having an energy bandgap ranging from 0 eV to 5 eV and

dielectric materials having a bulk dielectric constant at infinitely high frequencies of at least 5.

21. A insulating material according to claim 19, wherein the nanoparticle filler comprises a semiconducting material.

22. A insulating material according to claim 19, wherein the nanoparticle filler is selected from ZnO, SnO, InO, CeO, TiO_2, SiC. $BaTiO_3$, Al_2O_3, SiO_2 and mixtures thereof.

23. A insulating material according to any of claims 19-22, wherein the polymeric matrix comprises a rubber, a thermoplastic polymer, a thermosetting polymer or thermoplastic elastomer.

24. A insulating material according to claim 23, wherein the polymeric matrix comprises a polyolefin rubber, a thermoplastic polyolefin elastomer/plastomer, a silicone rubber or a crystalline thermoplastic polymer, preferably a crystalline thermoplastic polymer, and more preferably polyethylene.

25. A insulating material according to claim 23, wherein the polymeric matrix comprises a polymer selected from EPDM and polyethylene.

26. A insulating material according to any of claims 19-25, wherein the polymeric matrix comprises a polymer blend of immiscible polymers.

27. A insulating material according to claim 26, wherein the polymer blend is selected from polyethylene/EPDM, LDPE/HDPE, and maleic anhydride-modified EPDM/EPDM.

28. A insulating material according to any of claims 19-27, wherein the nanoparticles have a particle size ranging from 2 to 80 nm, preferably from 5 to 50 nm, and most preferably from 5 to 30 nm.

29. A insulating material according to any of claims 19-28, wherein the nanoparticle filler comprises less than 20% by volume of the insulating material, preferably less than 10% by volume of the insulating material, and most preferably less than 5% by volume of the insulating material.

30. A insulating material according to any of claims 19-29, wherein the surface of the nanoparticle filler is modified by treatment with a organosilane or organotitanate compound and the organosilane compound comprises an organic group selected from alkyl, alkylamino, amino and carboxy.

31. An insulating material according to claim 30, wherein the organic group is selected from methyl, decyl, octyl, vinyl, aminopropyl and acetoxy.

32. An insulating material comprising a nanoparticle filler distributed in a polymeric matrix, wherein the surface of the nanoparticle filler is modified by treatment with a organosilane or organotitanate compound and the organosilane compound comprises an organic group selected from alkyl, alkylamino, amino and carboxy.

33. An insulating material according to claim 32, wherein the organic group is selected from methyl, decyl, octyl, vinyl, aminopropyl and acetoxy.

34. An insulating material comprising a carbon nanotube filler distributed in a polymeric matrix, wherein the filler is heterogeneously distributed in the polymeric matrix and the polymeric matrix comprises a rubber, a thermoplastic polymer, a thermosetting polymer or thermoplastic elastomer, preferably a polyolefin rubber, a thermoplastic polyolefin elastomer/plastomer, a silicone rubber or a crystalline thermoplastic polymer, more preferably a crystalline thermoplastic polymer, and most preferably polyethylene.

35. An insulating material according to claim 34 wherein the polymeric matrix comprises a polymer selected from EPDM and polyethylene.

36. A process for manufacturing a field grading material, said process comprising

mixing a nanoparticle filler with at least one polymer in particulate form; and

heating the mixture to form a heterogeneous distribution of the nanoparticle filler in a matrix of the polymer.

37. A process according to claim 37, wherein the at least one polymer comprises a mixture of immiscible polymers.